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Texas Coralsnake Predation on Watersnakes in Central Texas

Delaney G. Kempf and David G. Barker*

Our report concerns observed predation in nature by a Texas coralsnake, *Micrurus tener*, on a diamond-backed watersnake, *Nerodia r. rhombifer*, and includes additional observations of coralsnakes in watersnake habitat.

The observed predation took place at the Cibolo Nature Center [CNC], a 100-acre reserve leased from the city of Boerne, Texas, and operated by the Friends of the Cibolo Wilderness, a nonprofit organization (Evans and Evans, 2004). The reserve is located in the Texas Hill Country to the north of Boerne in Kendall County, Texas. The property of the CNC includes a variety of habitats including an open field, spring-fed marsh and an area of juniper–oak woodlands. There is a 40-acre tallgrass prairie that is being managed through several stages of succession. The crown jewel of the property is Cibolo Creek, which flows along the southwest boundary of the reserve. The riparian woods that line the creek are dominated by towering bald cypress (*Taxodium distichum*) that shade much of the creek for its length through the CNC.

Twice annually, once in late spring and then later in early fall, the CNC sponsors the Wildlife Field Research event [WFR]. Teams of citizen scientists, Texas Master Naturalists, and other volunteers work at various projects to assay the general condition of the CNC property. Teams work to gather data on the diversity and population density of a wide variety of organisms, including prairie plants, aquatic invertebrates, ants butterflies, dragonflies and damselflies, birds, amphibians, reptiles and mammals. One of the authors [DGB] has led the herpetofaunal team that surveys the amphibians and reptiles for the past 12 years, and the other [DGK] has participated as team member for the past five years. We both also participate in a watersnake mark-and-recapture effort, one of the WFR projects.

For the herpetofauna teams, each WFR begins on a Wednesday afternoon and ends midday on a Saturday. During a WFR, the herpetofauna teams perform time-constrained searches of 14 separate areas of the CNC. There is some overlap between the herpetofaunal surveys and the separate searches for the two watersnake species present in Cibolo Creek, the blotched watersnake (*Nerodia erythrogaster transversa*) and the more common diamond-backed watersnake (*Nerodia r. rhombifer*).

On 5 May 2011 at 10:30 A.M. during the spring WFR, a herpetofauna survey team working along Cibolo Creek spotted a coralsnake. The coralsnake was looped over a cypress tree root; its head was on the far side of the root and not visible. The root was positioned on the edge of the creek in very shallow water (1–2 cm depth.) This stretch of the creek is a shallow water crossing and is probably the most heavily traversed area of the creek by visitors to the CNC. The depth at the center of the creek in this area is <40 cm, but depths nearby, upstream and downstream, are >1 m.

The team did not intend to collect the coralsnake, but one of the authors [DGK] cautiously approached to take some pictures and see what it was doing. As the head of the coralsnake came into view, it was clearly visible that the coralsnake was biting the head of a juvenile diamond-backed watersnake. The coralsnake was approximately 65–72 cm in total length, and the watersnake approximately 25–30 cm long. It appeared that the coralsnake had just struck down on the juvenile watersnake, biting it across the top of the head, as the watersnake was sitting or moving along the root in the shallow water. The coralsnake appeared to be oblivious to the survey team, which was now gathered around and taking flash photographs.

The team witnessed the coralsnake apply a constant forward pull on the watersnake. At first the watersnake resisted, doing its best to anchor itself with its posterior body. However, over a period of about one minute, the watersnake appeared to relax, likely due to the effects of the venom, and this allowed the coralsnake to easily stretch out the watersnake. At this point the watersnake was no longer attempting to anchor itself, and was now attempting to feebly pull its body forward, perhaps in an attempt to coil about the head of the coralsnake. The coralsnake then used its own body, looping it over the watersnake and pressing down such that the coralsnake was able to continue to pull the watersnake out straight. In less than three minutes the watersnake appeared to be paralyzed and no longer able to voluntarily move.

The coralsnake then made several adjustments in its hold on the head of the watersnake and lined it up to be swallowed. At this time, the end of the envenomation behavior and the beginning of the actual swallowing behavior, the coralsnake appeared to become aware of its audience. The coralsnake then moved under a tangle of cypress roots and vegetation, still holding the head of the watersnake in its mouth and pulling it along, until it was concealed from sight. No further observations were made.

Texas coralsnakes are known to eat a variety of snakes and

Texas coralsnake, *Micrurus tener*, beginning to swallow a diamond-backed watersnake, *Nerodia r. rhombifer*. Photograph by Delaney G. Kempf.

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lizards. Snakes appear to be taken more frequently than lizards, and among lizards skinks seem to be preferred. The following skink species have been observed in the stomachs of preserved Texas coralsnakes: five-lined skinks, *Plestiodon fasciatus*; short-lined skinks, *Plestiodon tetragrammus brevilineatus*; and ground skinks, *Scincella lateralis* (Schmidt, 1932; Greene, 1984; Roze, 1996). Often only the tails of skinks are found in coralsnake stomachs, suggesting that tail autotomy is a successful defense against coralsnake predation for skinks.

The following snake species have frequently been reported as Texas coralsnake prey: rough earthsnakes, *Virginia striatula*; rough greensnakes, *Opheodrys aestivus*; western groundsnakes, *Sonora semiannulata*; Texas brownsnakes, *Storeria dekayi texana*; lined snakes, *Tropidoclonion lineatum*; and Texas ratsnakes, *Pantherophis obsoletus*. Species reported less frequently include: glossy snakes, *Arizona elegans*; prairie ringnecked snakes, *Diadophis punctatus arnyi*; western smooth earthsnakes, *Virginia valeriae elegans*; checkered gartersnakes, *Thamnophis marcianus*; kingsnakes, *Lampropeltis getula*; prairie kingsnakes, *Lampropeltis calligaster*; Mexican milksnakes, *Lampropeltis annulata*; flat-headed snakes, *Tantilla gracilis*; Mexican black-headed snakes, *Tantilla atriceps*; coachwhips, *Coluber flagellum*; diamond-backed watersnakes, *Nerodia rhombifer*; and eastern patch-nosed snakes, *Salvadora grahamiae*; (Schmidt, 1932; Ruick, 1948; Wright and Wright, 1957; Greene, 1984; Tennant, 1984; Vermersch and Kuntz, 1986; Roze, 1996; Werler and Dixon, 2000; Price, 2009).

The extensive study of coralsnake diet by Greene (1984) reported several examples of copperheads, *Agkistrodon contortrix*, being consumed. Curtis (1952) reported an interesting case of cannibalism in which a Texas coralsnake (42.9 cm total length) was found to have consumed a smaller coralsnake (17.8 cm TL); when removed from the stomach of the larger coralsnake, the smaller coralsnake had a partially swallowed Texas brownsnake, *Storeria dekayi texana*, protruding from its mouth. Curtis hypothesized that the two coralsnakes began feeding on opposite ends of the Texas brownsnake, and when they met in the middle, the larger animal just continued to swallow the smaller coralsnake.

It is the experience of one of the authors [DGB] in separate attempts to maintain four different captive Texas coralsnakes that this species is reluctant to feed on all ages of watersnakes or gartersnakes. Three of these attempts took place at the Dallas Zoo during his employment there. When offered a variety of species of potential prey, all four coralsnakes readily fed on groundsnakes (*Sonora*), and rough earthsnakes (*Virginia*). All mammals and amphibians were refused, even when scented with snake scent. Three snakes occasionally consumed ground skinks (*Scincella*), but would not consistently eat them. Two coralsnakes refused neonates of two species of watersnakes (*N. rhombifer* and *N. erythrogaster*); two coralsnakes ate one of each species and then refused all other offerings. Exactly similar results were observed with neonates of two gartersnake species (*T. marcianus* and *T. sirtalis*).

Texas zoos have always felt some responsibility to display the Texas coralsnake, as it is a local and attractive venomous snake in most Texas cities with zoos. Neonate gartersnakes and watersnakes are probably the most convenient small snakes to commercially acquire as food for ophiophagous snakes, and we know from conversations with herp staff at other Texas zoos that all have tried to feed these two genera of snakes to coralsnakes with generally unsatisfactory results. In many zoos, individual Texas coralsnakes are exhibited temporarily, regularly replaced by other specimens that are brought to the zoo. There are examples of coralsnakes that lived in captivity and on exhibit for periods longer than a year, but these are rare; the Houston Zoo reptile house exhibited a rubber coralsnake model for many years.

The only report of a captive Texas coralsnake feeding on a diamond-backed watersnake of which we are aware is that of Tryon and McCrystal (1982). They reported that a recently collected gravid female coralsnake, after laying eggs, consumed two rough green snakes and one diamond-backed watersnake before being released. They were unable to entice the hatchlings to feed.

The Texas coralsnake, *Micrurus tener*, is the most commonly encountered venomous snake species in Kendall County, Texas. Coralsnakes are the only venomous species known to occur within the boundaries of the CNC. However, coralsnakes are an enigma at the CNC. For the first seven years of the WFR herpetofaunal survey, no coralsnakes were encountered or reported during the surveys; during that period, there were one or two sightings reported by visitors or employees during each of those years. In the past five years more than 20 coralsnakes have been seen and/or collected by the herpetofaunal survey teams during the WFRs, or reported by other WFR survey teams. Significantly more sightings of coralsnakes have been reported during each of those years by visitors to and employees of the CNC, although there are no exact records kept of the numbers. We note that during the past five years, most coralsnakes are observed within 10 m of Cibolo Creek; previous to this period most reported observations were near the visitor center and its parking lot, several hundred meters from Cibolo Creek. This is the area with the most human activity.

The reason for the increased visibility of coralsnakes is not known. It's possible that the population fluctuates and that this is a period of higher population densities. However, this has been a period of hot and dry weather conditions, including the driest 14-month period in recorded history. This allows for the possibility that coralsnakes have had to change their behaviors, becoming more visible by spending more time on the surface hunting for prey.

Throughout the drought-stricken Texas Hill Country, conditions in 2010–2012 were so severe that many insect species, spiders, amphibians, and most species of lizards and small snakes became noticeably absent. Watersnakes in the stretch of Cibolo Creek in the CNC remained visible, seemingly in stable and maybe even increasing numbers, possibly crowded because of the creek's low and dry conditions both upstream and downstream from the CNC.

It seems possible that our observation of predation on a diamond-backed watersnake may be evidence that coralsnakes are feeding increasingly on watersnakes, a dietary shift spawned

in response to very low densities and numbers of other snake or lizard species. We have made two other observations that support this possibility. Several members of the WFR survey team have on two occasions observed coralsnakes searching through piles of driftwood positioned in the center of Cibolo creek during daylight hours. These driftwood piles are composed of logs and dead branches deposited by past floods, and are favorite shelters for the two *Nerodia* species found in the creek. These driftwood piles were both about 3 to 4 m wide and 1 m high, and shared the common characteristic of being connected to the bank by a 3- to 4-m straight branch above the water that could serve as a bridge from the land to the driftwood pile. Of course we can't say with certainty why coralsnakes were found in driftwood piles in the middle of Cibolo Creek, but we feel there is a strong possibility that they were hunting watersnakes.

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Observations on the Ecology of the Wood Turtle (*Glyptemys insculpta*) in Northeastern Wisconsin

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Abstract

We studied habitat use, movements, population structure and behavior of wood turtles in Brown County, Wisconsin. Radiotelemetry permitted us to monitor known individuals over time. Turtles were less restricted to floodplain habitat than expected based on prior incidental observations of untagged individuals. Although some turtles could be found in or near riverine habitat throughout the summer, others spent extended periods of time in upland forested, grassy, or edge habitats. Many turtles were found in habitat or microhabitat created or modified by beaver. Individual turtles typically alternated sedentary periods with longer movements (up to 236 m in a single day). We collected more females than males, but males tended to achieve larger sizes than females. Observed behaviors included use of the forelimbs to flip sediment upon the carapace when leaving the water and aggressive behavior between males. The results of this study indicate that floodplain zoning would be insufficient to preserve the range of habitat used by this species.

Introduction

The wood turtle (*Glyptemys insculpta*) originally occurred through much of the northeastern United States and into southeastern Canada, but it has declined through much of its range (e.g., Garber and Burger, 1995; Daigle and Jutras, 2005) and is protected in most states (Ernst and Lovich, 2009). Trends in the biology of this species were reviewed by Ernst and Lovich (2009). The purpose of this paper is to provide information on wood turtle ecology and behavior at a site in northeastern Wisconsin. Previous studies of wood turtles in Wisconsin include those of Brewster and Brewster (1991) and Ross et al. (1991).

Methods

Data were collected along a small, shallow river in Brown County, Wisconsin. The exact location is not provided because of the threatened status of this species. The area around the stretch of river inhabited by the turtles included lowland forest of white cedar and hemlock, upland forest of sugar maple and beech, and grassy clearings. Outlying areas were used for agriculture (primarily corn). Thirteen transects across the river at randomly selected locations on 14 October 1989 were used to collect data on mean width (9.60 m, SE = 1.50 m) and midstream depth (0.36 m, SE = 0.10 m). At least some hard substrate (cobble or gravel) was noted along each transect, but silt or leafy debris was also sometimes present. One or more (as many as five) active beaver dams were situated along the study reach of the river during some years of this study. In some years, however, anadromous salmon (*Oncorhynchus* spp.) were able to penetrate upstream as far as the study reach, and in at least one year, moreover, surface water flow was low enough to reduce stretches of the river to isolated pools.

Incidental observations of wood turtles were made in the study area from 1987 to 1994. Concentrated efforts, including radiotelemetry, occurred in 1991–1993. During 1991 and 1992, turtles were collected by hand, with more effort expended in 1991 than in 1992. Sex was determined using secondary characteristics, including the position of the cloacal opening with respect to the margin of the carapace and the concavity of the plastron. Straight-line plastron length was measured to the nearest mm. Age was determined by counting growth rings on the right pectoral scute. Individuals were marked by unique combinations of marginal notches.

Seven turtles (five females, two males) were radiotagged for varying durations of time. A transmitter was glued to the carapace of each radiotagged turtle. Radiotagged turtles were located at least once per week (but usually more often) during the warm season, but much more sporadically during the winter..

Results and Discussion

Because most of our results are consistent with previous studies, we present our observations here briefly. They are organized in the following general categories:

Habitat Use

Our impressions of habitat use would have been affected by whether or not we used radiotelemetry. Incidental observations of wood turtles were concentrated in or near the river. From mid-April to mid-May, some turtles were observed in the river or on sandy banks, but they were also relatively easy to find on forested floodplain terraces adjacent to the river, where they basked in open areas that would later be choked with herbaceous vegetation and/or shaded when trees leafed out overhead. At this time, sand or silt on their carapaces helped them blend in with the dead leaves on the forest floor. As the season progressed, some wood turtles could be observed in the river or associated oxbow ponds throughout the summer, either swimming or basking on woody debris.

Radiotagged turtles spent substantial periods of time in upland habitat, including beech-maple forest, grassy openings, and edge habitat, up to 175 m from the river. In particular, some turtles moved to patches of dewberries or blackberries (*Rubus* spp.) in

or at the edges of grassy clearings as their fruits were ripening and remained for weeks. Turtles were often so well hidden beneath grasses and low branches of shrubs that they were difficult to find even with the signals provided by the radiotags. Once we were aware of this we were able to find untagged turtles in areas where we had no doubt walked past them in previous years.

Turtles were sometimes found in habitat modified by beaver. Openings created when beavers cut trees provided sunlit patches of forest floor where turtles could bask, and downed trees provided adjacent cover. In the river, turtles were sometimes observed in the vicinity of beaver dams.

One radiotagged turtle spent at least seven days in a cornfield (observed six times during the period 12–19 August), where it fed on corn from stalks knocked down by whitetail deer (Cochran et al., in prep.). Use of cornfields by wood turtles has been reported by Kaufmann (1992a) and Castellano and Behler (2003). More general consideration of the effects of agricultural activity on wood turtles was provided by Saumure and Bider (1998) and Saumure et al. (2007).

Our results are consistent in some ways with trends in habitat use reviewed by Ernst and Lovich (2009) but inconsistent in other ways. They reported that wood turtles tend to be found in clear streams with moderate current and gravel or otherwise hard bottom substrate, descriptors that would be applicable to our study stream. However, they also suggested that wood turtles in Wisconsin and Michigan tend to be aquatic, especially relative to eastern populations. This is not entirely consistent with our observations. Although wood turtles could be observed in or near aquatic habitat throughout the summer in our study area, many turtles could be found in upland habitat distant from the river, and radiotagged individuals spent extended periods in upland habitat without returning to water. It may be that wood turtles in or near water are more readily detectable (e.g., while basking) than those concealed in upland areas.

Upland habitat use has implications for conservation of wood turtles. In our study area, for example, floodplain zoning alone would not be sufficient to protect the range of habitat used by this species throughout the year. Buffer zones around riparian habitat have been recommended for other species thought of as primarily riparian or aquatic (e.g., Roth, 2005).

Movements

Individual turtles seemed to alternate periods during which they were relatively sedentary with occasional longer movements. As discussed above, turtles spent extended periods during the spring basking on floodplain terraces adjacent to the river, and some turtles spent long periods in blackberry or dewberry patches. One turtle for example, moved only 1 m during a seven-day period (it was located five times during this interval). The longest movement observed in a 24-h period was 236 m. The turtle we observed in a cornfield moved from there to a blackberry patch 172 m away in one day, crossing the river in the process. It should be noted that the distances provided here are minimum estimates of the distances actually moved as they are based on straight-line distances between starting and ending points. Woods (1945) observed an adult wood turtle move 137 m in 25 minutes, and Strang (1983) reported a mean 24-h straight-line displacement of 60 m during the summer.

Overwintering

Wood turtles overwintered in the river. On 14 March 1987, an adult was observed on the bottom of the river approximately 2 m from shore at a depth of less than 0.5 m. It was facing upstream < 1 m from an accumulation of large woody debris that almost dammed the stream. After an intervening spell of warm weather, the turtle was no longer present on 31 March.

We were not able to locate most radiotagged turtles during the winter, perhaps because radio signals attenuate rapidly underwater. However, one female was located on several occasions during the winter of 1992–1993. On 22 December, 10 January, and 1 February, the strongest signal came from mid-river, through the ice, approximately 60 m upstream from a beaver dam. On 22 February and 12 March, the strongest signal was from approximately 10 m downstream from the first site and beneath an overhanging bank. On the latter date, evidence of otter activity was present within 3 m, but the turtle was found in good condition on 19 May approximately 2 m from the water.

Population Size and Composition

We calculated a simple mark-and-recapture estimate of the adult wood turtle population size in 1991 by using the Chapman Modification of the Petersen Index (Ricker, 1975). The 42 turtles collected and marked in 1991 were used as the first sample, and the 10 marked (recaptured) and 14 unmarked turtles found in 1992 were used as the second sample. The resulting population estimate, admittedly crude, was 97.7 individuals (95% confidence limits: 55.4–188.6). Assumptions of this estimate include no immigration or recruitment in between marking and recapture and no differential loss of marked individuals from the population relative to unmarked individuals. More complex mark-and-recapture procedures have been recently applied to wood turtles (Daigle and Jutras, 2005).

Ernst and Lovich (2009) reported that previous studies have found sex ratios of wood turtles to range from female biased to male biased. We tended to encounter more females than males. Sex ratio, based on turtles at first capture, was 0.39:1 (males: females) for 1991, the most intensive year of sampling, and 0.53:1 for the study period overall. It is possible that females were caught in excess because they were relatively more vulnerable to capture during the nesting season.

A hatchling (plastron length 33 mm; umbilical scar still visible) was discovered on 3 May 1987 in a small muddy depression 21 cm from the water's edge approximately 75 m downstream from a steep sandbank that may have been a nesting area. Other than this individual, all turtles observed ranged in plastron length from 85 mm to 189 mm, with many turtles in the 150–160 mm range. Although there was extensive overlap between males and females, relatively more males were observed among the larger size classes (> 160 mm). Lovich et al. (1990) noted that adult males achieve greater body size than females. Ages ranged from 4 to 25 years, with most turtles greater than 14 years old.

Behavior

Copulation was observed on two occasions. On the morning of 1 May 1988, a larger male was observed on the back of a smaller female on the bottom of the river approximately 2 m from shore at a depth of 20–25 cm. On the morning of 30 May 1991, an audible clacking noise drew attention to a copulating pair in the water on the opposite edge of the river. They were facing the shoreline with the female entirely submerged, except for her head, and the male with just its plastron submerged. After approximately one minute, the pair rolled sideways and submerged, but remained in contact. After another minute, the pair disappeared from view in the high, muddy water. Ernst and Lovich (2009) indicated that copulation may occur in autumn or spring, that it usually occurs in the water, and that it may be accompanied by audible thumping.

On 28 April 1991, we collected three pairs of turtles, male and female, in floodplain terrace habitat. The males were approximately 1.5, 9.5 and 20 m from the respective females, and in all cases they were pointed in the general direction of the females. This may have been coincidental, but it suggests the possibility that male wood turtles orient towards or follow females during the mating season, even in terrestrial environments.

Harding and Bloomer (1979) reported that a wood turtle leaving the water may use its front limbs to throw sand or dirt over its shell, presumably to make it more inconspicuous in a terrestrial environment. At 11:45 on 11 June 1991, a wood turtle that had partly emerged from the water on a small peninsula used its front limbs 4–5 times to flip sediment onto its wet carapace. After moving about the peninsula for 10 minutes, the turtle entered the water for five minutes. At 12:00, the turtle again flipped sediment onto its carapace when leaving the water. Then it moved approximately 5 m inland to a dry, sandy patch and used its front limbs to flip sand onto its carapace, which was still wet, until a thin layer of sand covered approximately 80% of its surface. At 12:15, the turtle disappeared into herbaceous cover.

A case of agonistic behavior involving male wood turtles was observed on the afternoon of 30 June 1992. Two adult males that had been captured in separate terrestrial locations and handled for approximately 30 minutes while being measured, marked by notching, and fitted with radiotags were placed in the bed of a pickup truck. One turtle was observed moving rapidly away from the other, which chased it, bit its tail, and held on. After being separated, the turtles resumed the chase, both gaping their mouths widely, but eventually ended up in opposite corners of the truck. Kaufmann (1992b) provided detailed descriptions of agonistic behavior in this species, with male–male interactions being especially frequent.

Interactions with Other Species

Wood turtles in Brown County interacted with other species in a variety of ways. Their use of animals, plants, and fungi as food and their potential role in seed dispersal are described by Cochran et al. (in prep.). Their use of habitat modified by beaver is described above, as is a case of a turtle feeding on corn knocked down by deer.

Wood turtles were observed basking on woody debris interspersed with painted turtles (*Chrysemys picta*), with no obvious interactions. On one occasion a wood turtle was observed swimming toward a painted turtle sitting along the shoreline. The painted turtle swam away, but it was not clear that it was in response to the wood turtle.

Some wood turtles at our study site had been injured during past encounters with predators that left them with limb stubs or other damage. For example, in a sample of 13 turtles collected on 19 May 1993, five turtles displayed the following injuries (plastron lengths in parentheses): 1. male (159 mm)—left front leg, right rear leg, and tail stubs, plastron damaged; 2. male (167 mm)—left front leg stub; 3. female (113 mm)—tail stub, left rear edge of carapace damaged; 4. male (176 mm)—right and left front legs stubs; 5. female (157 mm)—right and left front legs stubs. Potential predators observed in the study area included raccoon, red fox, and otter. We found remains of only one dead turtle during this study (the empty shell of one that had been radiotagged). Wood turtles with missing limbs have been found in other locations (e.g., Farrell and Graham, 1991).

Wood turtles are parasitized by leeches (Saumure and Bider, 1996, and references therein). We removed a large *Placobdella parasitica* from a turtle caught on 19 May 1993 but did not routinely identify the leeches we observed on other turtles. We may also have missed leeches on some turtles that kept their limbs tightly withdrawn. However, as many as 25 leeches were observed on individual turtles, and three of six turtles collected on floodplain terraces on 28 April 1991 carried at least one leech.

Acknowledgments

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Postscript Added by Senior Author

When I conducted this study with my undergraduate students in the early 1990s, it was pre-GPS, pre-GIS, and pre-PIT. By the time these advances became available later in the decade, my access to the study area was restricted as the land changed ownership and it was sub-divided for residential development. Shortly thereafter I moved from Wisconsin to Minnesota. I have not been back to the study area since the late 1990s. Because of the changes being wrought by the rapidly increasing human population in Brown County, to which I have alluded in these pages previously (Cochran, 2012), it was with some trepidation that I recently used Google Earth to view the study area. I was somewhat relieved to see that, as of 2011, most of the area used by the turtles appeared to be intact. However, threats to the resident wood turtles from humans, their cars, and their pets have no doubt increased.

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Reproduction of Six-lined Racerunners, *Aspidoscelis sexlineata* (Squamata: Teiidae), from New Mexico

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Abstract

The reproductive cycle of *Aspidoscelis sexlineata* from New Mexico was studied utilizing a histological examination of museum specimens. Male reproductive activity (spermiogenesis) occurred from April through July. The smallest reproductively active male (spermiogenesis in progress) measured 48 mm snout–vent length. Female reproductive activity occurred in May and June. Mean clutch size (N = 12) was 3.3 ± 1.2 SD, range = 2–6 which is within the range of *A. sexlineata* from other parts of its distribution. The smallest reproductively active female measured 57 mm SVL. There was no evidence to suggest *A. sexlineata* females produced multiple clutches in New Mexico. Linear regression analysis revealed a significant positive relation between female body size and clutch size.

Aspidoscelis sexlineata (Linnaeus, 1766) has one of the largest longitudinal distributions of any North American lizard, ranging from southern South Dakota, southeast Michigan, and Maryland south to southern Texas, the Gulf Coast and Florida Keys, eastern Colorado and New Mexico to the Atlantic Coast (Stebbins, 2003). Information on reproduction of *A. sexlineata* is in many sources. The most detailed information is in: Fitch (1958, 1970, 1985), Carpenter (1960), Hardy (1962), Hoddenbach (1966), Clark (1976), Brackin (1979), Trauth (1983), Johnson and Jacob (1984), Etheridge et al. (1986). Anecdotal information is in: Force (1930), Boyer and Heinze (1934), Marr (1944); Minton (1944), Smith (1946), Stebbins (1954, 2003), Parmalee (1955), Brown (1956), Anderson (1965), Mount (1975), Behler and King (1979), Conant and Collins (1991), Collins and Collins (1993), Mitchell (1994), Williamson et al. (1994), Palmer and Braswell (1995), Busby et al. (1996), Hammerson (1999), Johnson (2000), Collins et al. (2010), Fogell (2010), Niemiller et al. (2013). The biology of *A. sexlineata* is summarized in Trauth and McAllister (1996). The purpose of this paper is to provide information on the reproductive biology of *A. sexlineata* from New Mexico. To my knowledge, this is the first information on the reproductive cycle of *A. sexlineata* from New Mexico based on museum specimens with accession numbers.

Methods

A sample of 64 *A. sexlineata* from New Mexico consisting of 36 adult males (mean snout–vent length, SVL = 63.0 mm ± 5.2 SD, range = 48–70 mm), 4 subadult males (mean SVL = 43.8 mm ± 2.5 SD, range = 41–47 mm), 17 adult females (mean SVL = 63.8 mm ± 5.6 SD, range = 57–76 mm), 6 subadult females (mean SVL = 44.2 mm ± 5.2 SD, range = 38–52 mm) and one presumed neonate (SVL = 30 mm) was examined from the herpetology collections of the Museum of Southwestern Biology (MSB), University of New Mexico, Albuquerque, USA and the Natural History Museum of Los Angeles County (LACM), Los Angeles, California, USA (Appendix). *Aspidoscelis sexlineata* were collected 1959 to 2008.

A small incision was made in the lower part of the abdomen and the left gonad was removed for histological examination. Gonads were embedded in paraffin, sections were cut at 5 µm and stained with Harris hematoxylin followed by eosin counterstain. Histology slides were deposited in MSB or LACM. Enlarged ovarian follicles (> 4 mm length) or oviductal eggs were counted. An unpaired t-test was used to test for differences between male and female SVLs and the relationship between female body size (SVL) and clutch size was examined by linear regression analysis using Instat 3 (Graphpad, San Diego, CA).

Results

There was no significant difference between male and female mean SVLs (unpaired *t*-test) $P = 0.64$, $t = 0.47$, $df = 51$. Monthly changes in the testicular cycle are in Table 1. Three stages in the testicular cycle were present: (1) Regressed: seminiferous tubules are at their smallest sizes and contain spermatogonia and interspersed Sertoli cells; (2) Recrudescence: a proliferation of germ cells for the next period of spermiogenesis is evident as primary and sometimes secondary spermatocytes predominate; (3) Spermiogenesis: lumina of the seminiferous tubules are lined by sperm or clusters of metamorphosing spermatids. The period of sperm production (spermiogenesis) encompassed April through July. No males from August were examined so it is not known when spermiogenesis ceased in *A. sexlineata* from New Mexico. The smallest reproductively active male (spermiogenesis in progress) measured 48 mm SVL (MSB

Table 1. Monthly stages in the testicular cycle of 36 adult *Aspidoscelis sexlineata* males from New Mexico.

Month	*n*	Regression	Recrudescence	Spermiogenesis
April	4	0	0	4
May	18	0	1	17
June	12	0	0	12
July	2	1	0	1

Table 2. Monthly stages in the ovarian cycle of 17 adult *Aspidoscelis sexlineata* females from New Mexico.

Month	*n*	Quiescent	Yolk deposition	Enlarged follicles > 4 mm	Oviductal eggs
May	7	3	0	3	1
June	10	2	1	3	4

14653) and was collected in May. Four slightly smaller males collected in May (range: 41–47 mm) had not commenced spermiogenesis and were considered as juveniles.

Four stages were noted in the ovarian cycle of *A. sexlineata* from New Mexico (Table 2). (1) Quiescent: no yolk deposition; (2) Early yolk deposition: (basophilic yolk granules) in ooplasm; (3) Enlarged ovarian follicles > 4 mm; (4) Oviductal eggs. No females from April were examined so it is not known when female *A. sexlineata* from New Mexico commenced reproduction. The smallest reproductively active female measured 57 mm SVL, contained two enlarged follicles (MSB 36877) and was collected in May. Six smaller females (SVL range = 38–52 mm) five collected in May, one collected in August, exhibited quiescent ovaries and were considered to be juveniles. Mean clutch size (N = 12) = 3.3 ± 1.2 SD, range = 2–6. Linear regression analysis revealed a significant positive relationship between female body size (SVL) and clutch size (N = 12). This relation is shown by the regression equation (Y = -6.4 + 0.15X, $r = 0.64$, $P = 0.02$). Trauth (1983) previously reported a significant positive correlation between female body size and clutch size. There was no evidence to indicate *A. sexlineata* produced multiple clutches in the same year in New Mexico (oviductal eggs or corpora lutea and concurrent yolk deposition in the same female). However, my failure to find such females may have resulted from my small sample size (N = 17). Hoddenbach (1966) reported female *A. sexlineata* from Texas produced two egg clutches per reproductive season. One presumably young of the year (SVL = 30 mm) collected in September (LACM 66268) was presumably born earlier in the same summer.

Discussion

The timing of the reproductive cycle of *A. sexlineata* is similar to other temperate zone North American teiid lizards as the reproductive season generally begins in May and terminates in August (Vitt and Breitenbach, 1993). Young emerge in summer and have time to feed and accumulate fat stores before entering hibernation. The mean clutch size of *A. sexlineata* females from New Mexico is within the limits of other populations of this species (see Trauth, 1983). My failure to find a female with a one-egg clutch as has been reported for *A. sexlineata* in other parts of its range (Trauth, 1983), likely resulted from my small sample size.

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Appendix

Aspidoscelis sexlineata from New Mexico by county, examined from the herpetology collections of the Museum of Biology (MSB) University of New Mexico, Albuquerque, USA, and the Natural History Museum of Los Angeles County (LACM), Los Angeles.
Chaves: MSB 12481, 12788, 12789, 13621, 14417-14419, 14519, 14520, 14653, 14654, 14779, 14780, 14827, 14828, 15241, 15242, 15386, 15954, 21952, 21962, 21964, 21966, 72661,74626, 74632, 74633, 74648, 74650, 74651, LACM 66268, 66269; **Curry**: MSB 36864, 36877, 36878, 36880, 36883; **Eddy**: MSB 43712, 59903; **Harding**: MSB 21955, 21957, 34917; **Lea**: MSB 60199, 60205, 60248, 60472, 60495, 60504, 60512; **Roosevelt**: MSB 49993-49996, 49998, 49999, 56533, 56744, 59939; **San Miguel**: MSB 8137, 39342, 40909, 40910; **Union**: MSB 36320, 37068.

Herpetology 2014

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

DUSKY SALAMANDERS ON WET ROCK FACES

J. A. Crawford and W. E. Peterman [2013, Copeia 2013(4): 580-584] note that the importance of plethodontid salamanders in forested ecosystems has been recognized for decades, and studies aimed at quantifying salamander biomass and determining habitat requirements have become more common. However, there is a lack of knowledge on the use and contribution of vertical structures (e.g., wet rock faces) to total salamander biomass within a forested ecosystem. This study characterized the population density, biomass, and habitat use of a wet rock face by a stream-salamander assemblage (three species: *Desmognathus ocoee*, *D. monticola* and *D. quadramaculatus*). The authors estimated the population density to be 14.69 salamanders m^{-2} and the total biomass to be 27.16 g m^{-2}, which is more than two times greater than any salamander biomass reported previously in the eastern United States. They also found significant habitat partitioning of the vertical gradient by the three species of salamanders in the assemblage. The stable microclimate and increased protection from other predators (e.g., mammals, snakes, and ground-foraging birds) provided by wet rock faces likely leads to the increased amount of biomass found in this study. Although the salamanders are likely protected from most noncaudate predators, the spatial structuring in the assemblage still follows an intraguild predation gradient found in horizontal habitats.

FOWLER'S TOAD SEX RATIOS

D. M. Green [2013, Copeia 2013(4):647-652] notes that sex ratios among anurans at breeding sites are routinely observed to be skewed toward males, which has implications for the strength of sexual selection in these animals. However, the relative numbers of males and females observed at breeding sites also depends upon their relative conspicuousness and the physical sex ratio of the adult population as a whole, which includes animals not present at breeding sites. Using intensive capture–recapture methods, the author estimated abundances of both sexes of Fowler's toads (*Anaxyrus fowleri*) in a population at Long Point, Ontario, over a span of 14 years (1998 to 2011, incl.). Although males greatly outnumbered females at breeding sites, persisted there for longer periods of time, and were more readily recaptured, both sexes could be found in their lakeshore nonbreeding habitat with equivalent reliability. Estimates of abundance were calculated for each sex based on 3,162 total captures of 686 females and 982 males. The abundances of males and females each year were not significantly different ($P = 0.738$), which was consistent with a 1:1 physical sex ratio. Both sexes also exhibited large, but strongly correlated ($P << 0.001$; $R^2 = 0.838$), variations in their abundance over the 14 yrs. Only 39% of total estimated males were found at breeding sites. The ratio of males at breeding sites to total males declined significantly ($P = 0.002$; $R^2 = 0.542$) over the 14-year study, in parallel with a diminishing availability of breeding sites.

SAND LIZARD HABITAT USE

O. A. Stellatelli et al [2013, Herpetologica 69(4):455-465] note that the introduction of exotic tree species may interfere with conservation efforts for natural habitats, including grasslands in coastal sand dunes. Natural plant cover is used by several species in coastal dunes of Buenos Aires, Argentina, among them the lizard *Liolaemus wiegmannii*. The authors studied the habitat use and abundance of this lizard inhabiting a psammophytic grassland within this ecosystem, where *Acacia longifolia* was recently introduced. Surveys and lizard sampling were conducted along 40 transects distributed in four independent zones of 75 ha, each with a different degree of invasion impact. Structural and thermal features were measured in relation to *A. longifolia* and native plants. The lizard *L. wiegmannii* was three times more abundant in zones with ≤ 25% coverage of *A. longifolia*. All age classes selected native shrubs and avoided *A. longifolia* trees. These results were similar in greenhouse experiments. However, no differences were found in the use of any of these plants' (introduced or native) leaf litter. Structural and thermal characteristics of the habitat under the shrubs seemed to be more favorable for the physiological performance and behavior of *L. wiegmannii,* whereas the lower temperatures under *A. longifolia* might explain the lower presence of lizards in areas where this tree was introduced.

UV EXPOSURE AND VITAMIN D IN ANOLES

G. W. Ferguson et al. [2013, J. Herpetology 47(4):524-529] report that in Jamaica, free-living male and female-sized *Anolis sagrei* are exposed to more natural ultraviolet-B (UVB) from sunlight than male and female-sized *Anolis lineatopus*. In the laboratory, they tested predictions derived from the hypothesis that *Anolis* possess a mechanism for behaviorally photo-regulating their exposure to UVB depending on their dietary intake of vitamin D_3. *Anolis sagrei* voluntarily exposed themselves more frequently to visible and UVB light and received higher doses of UVB in an artificial light gradient when fed a low vitamin D_3 diet for 6 weeks than when subsequently fed a high dietary vitamin D_3 diet for 6 weeks. When the anoles' diet was returned to the low vitamin D_3 regimen for a third 6-week period, UVB exposure remained lower than in the first 6-week period. This suggests an initial UV photo-regulatory adjustment to high dietary vitamin D_3 but a slow return to greater reliance on UVB-induced endogenous vitamin D_3 production. Conversely, while exposing themselves to UVB with similar frequency and doses as *A. sagrei* over the course of the 18-week experiment, *A. lineatopus* did not show the same decreased attraction to visible and UVB light in response to increased dietary vitamin D_3. The response of *A. sagrei* in the laboratory to visible light without UVB was similar to their response to visible light with UVB. Therefore, the anoles appeared to be responding primarily to visible light. *Anolis lineatopus* may be unable to use dietary vitamin D_3 to restore low vitamin D status.

NATURAL HISTORY OF HONG KONG NEWTS

V. W. K. Fu et al. [2013, Herpetological Monographs 27:1-22] report that *Paramesotriton hongkongensis* has a highly restricted distribution in southern China, and a comprehensive study of the species' basic ecology in aquatic and terrestrial habitats has not been previously undertaken. Using mark-recapture methods, the authors assessed seasonal patterns of breeding populations in four streams in Hong Kong every 3 wk over 18 mo (2007–2009). They examined diet and body condition of newts in the four focal and six additional streams. They surveyed transects radiating outward from breeding pools to determine the extent of terrestrial habitats used. In the four focal streams, we made 3436 captures of adult newts, comprising 1312 unique individuals. Breeding occurred primarily during the dry, cool season and extended over 8 mo. Individuals remained in breeding pools for an average of 45 days, suggesting that populations in pools were changing throughout the breeding season and that most individuals had a 10-mo terrestrial phase. Sex ratio changed across the breeding season, with males making up larger proportions of populations earlier in the season. Breeding site fidelity averaged 24% and was density-dependent. Among the 47 identified prey types identified in the diet of 406 newts, the most important prey were *Brotia* snails, *Caridina* shrimp, newt eggs, baetid mayflies, and calamoceratid caddisflies, in composite making up 63% of total prey volume and 82% of total prey abundance. Cannibalism of eggs and larvae, primarily by females, largely explained differences in diet between sexes. No systematic difference in adult body condition (size-weight relationship) was found among streams. Fifteen individuals were found in forested habitats within 100 m of the nearest stream, except a single individual located 228 m away. This work demonstrates that *P. hongkongensis* occurs at relatively high densities in stream pools during a protracted breeding season, in which individuals show site fidelity but probably do not breed every year. The species appears to be a generalist predator in most aquatic habitats. Although individuals spend most of the year on land, little is understood about the spatial extent of terrestrial habitat use by the species. Future investigations should focus on the species' ecology in terrestrial habitats and on determining the amount of forest cover around breeding sites necessary to protect *P. hongkongensis* populations in Hong Kong.

GENETICS OF CAGLE'S MAP TURTLES

R. Ward et al. [2013, Copeia 2013(4):723-728] investigated genetic variability in 101 individuals of the Cagle's map turtle (*Graptemys caglei*) collected from across most of its extant distribution in the Guadalupe River and from a site on the San Marcos River of Texas. Analyses of allelic variation in microsatellite loci indicated individuals from the San Marcos River were genetically similar to conspecifics from the middle Guadalupe River. Turtles from the upper Guadalupe River, on the other hand, were genetically divergent from middle Guadalupe River individuals. Isolation by distance appears to play a major role in genetic structuring within the Guadalupe River. Anthropogenic features (e.g., dams and reservoirs), while they may be expected to restrict gene flow, appear to have had little impact on genetic structure.

NESTING SITES OF THE MARY RIVER TURTLE

M. A. Micheli-Campbell et al. [2013, Herpetologica 69(4):383-396] note that understanding why turtles select specific localities to nest over others is important for management and conservation. For some species of freshwater turtle, the same localities are selected year upon year, but it is uncertain whether these localities are selected due to favored environmental conditions, or natal-site homing. The Mary River turtle (*Elusor macrurus*) is an endangered freshwater species from Australia, and nesting data gathered between 2004 and 2011 demonstrated that female *E. macrurus* select to nest in specific localities along the Mary River. The authors used time-lapse infrared photography and image-identification analysis to assess whether the same individuals returned to the same nesting banks over three consecutive years (nest-site fidelity), and compared the physical and soil characteristics of nesting areas against other localities along the river where the turtles were not recorded to nest. The photography study illustrated that some females returned to nest at the same locality over consecutive years, whereas others did not; therefore, it is still inconclusive whether *E. macrurus* exhibits true nest-site fidelity. Preferred nesting areas were all northerly facing and thus exposed to higher levels of solar radiation than nonpreferred areas with similar soil and physical characteristics. Consequently, the preferred nesting areas exhibited significantly greater mean and daily fluctuations in the nest temperature compared with other areas with dummy nests. The authors suggest that the warmer nest temperature would speed up embryo development; therefore, female *E. macrurus* select to nest on northerly facing banks in an attempt to reduce the embryo incubation period. A possible reason for this behavior may be to reduce their exposure to nest-raiding predators. The study highlights importance of key nesting areas along the Mary River for the conservation of *E. macrurus*.

ALLIGATOR SNAPPERS IN SOUTH ALABAMA

B. Folt and J. C. Godwin [2013, Chelonian Conservation and Biology 12(2):211-217] note that historic commercial collecting of the alligator snapping turtle (*Macrochelys temminckii*) appears to have severely reduced populations throughout much of its range. This study analyzes 8 seasons of turtle-trapping data from 11 major rivers in southern Alabama and provides the first report on the status of the species in the state. During 1332 trap nights, 93 *M. temminckii* were captured in 7 rivers in south Alabama. This study showed relatively low overall catch per unit effort (CPUE; 0.062 using paired hoop nets connected by a lead net, 0.081 using single-baited hoop nets) compared with recent studies from other states. Based on relative abundances, size distributions, and sex ratios, the study documents variation in abundance among independent river populations as well as unexpected sex ratios. In particular, the Fowl River population is characterized by unexpectedly high abundance (0.478 CPUE) and may represent historic population conditions prior to commercial trapping. The authors discuss distribution and abundances, conservation concerns, and the significance of the Fowl River with respect to the recovery of populations throughout the species' range. This study contributes baseline population data to better understand the ecology and conservation of *M. temminckii* both in Alabama and across its entire range.

DETERRING LOGGERHEAD NEST PREDATORS

A. S. Lamarre-DeJesus and C. R. Griffin [2013, Chelonian Conservation and Biology 12(2):262-267] tested the effectiveness of nest screens and habanero pepper powder as deterrents for reducing depredation of loggerhead sea turtle (*Caretta caretta*) nests on Sand Island, South Carolina, including nest-screening (1 × 1-m plastic or metal mesh secured over the nest; $n = 33$), surface-treatment (15 ml of habanero pepper powder sprinkled on the surface of the sand; $n = 10$), bottom-treatment (15 ml of habanero pepper powder sprinkled 3 cm above the top egg; $n = 10$), and 10 control nests. Twenty-two of 66 nests were partially or completely depredated by coyotes (*Canis latrans*), and nest survival rates varied from a high of 80% for surface-treated, 75% for screened, 45% for bottom-treated, and 32% for control nests. Early surface-treatment of nests with pepper powder may provide an effective and more efficient management alternative to using screens, which are more difficult and costly to install, for reducing nest depredation at sea turtle nests.

PREDATION ON CROCODILIANS

R. Somaweera et al. [2013, Herpetological Monographs 27:23-51] note that although adult crocodilians have few predators (mostly humans and other crocodilians), hatchlings and eggs are killed and consumed by a diverse array of invertebrates, fishes, anurans, reptiles, birds and mammals. Using published literature they evaluated the incidence of predation in crocodilian populations, and its implications for crocodilian life-history evolution. Presumably because predation is size-dependent, small-bodied crocodilian taxa appear to be more vulnerable to predation (across a range of life stages) than are larger-bodied species. Several features of crocodilian biology likely reflect adaptations to reducing vulnerability to predation. For example, the threat of predation may have influenced the evolution of traits such as nest-site selection, maternal care of eggs and hatchlings, crèche behavior in hatchlings, and cryptic coloration and patterning. Even for such large and superficially invulnerable taxa such as crocodilians, the avoidance of predation appears to have been a significant selective force on behavior, morphology and ecology.

ALLIGATORS CAN LOCATE UNDERWATER SOUNDS

V. Dinets [2013, J. Herpetology 47(4):521-523] notes that crocodilians are known to be able to locate the source of airborne sound. However, locating the source of waterborne sound is difficult for physical reasons. The author tested the ability of American alligators (*Alligator mississippiensis*) to determine the direction toward the source of underwater sound by using their tendency to be attracted to slaps on the water surface. To produce surface slapping sounds with no airborne component, the author slapped the surface of the water inside a submerged diving bell and recorded the direction of alligator movements after the sound. The results show that alligators have a directionally biased response to waterborne sounds, indicating that they can locate the source of a sound signal transmitted through the water. It would be physically difficult for the animal to do so by using the differences in time of sound arrival or in amplitude between left and right sides of the animal's head, so it is likely that alligators use other methods such as a sound pressure gradient system.

JUVENILE HAWKSBILL TURTLES

J. Carrión-Cortez et al. [2013, Chelonian Conservation and Biology 12(2):235-245] note that the hawksbill turtle (*Eretmochelys imbricata*) is critically endangered, particularly in the eastern Pacific, a region where knowledge of the ecological traits is very limited. Understanding habitat preferences of hawksbills at different life stages is necessary to create effective local and regional conservation strategies. The authors studied habitat use and the diet of juvenile hawksbill sea turtles at Punta Coyote, a rocky reef located along the Nicoya Peninsula on the north Pacific coast of Costa Rica. They tracked 12 juvenile hawksbills (36–69-cm curved carapace length) with acoustic transmitters to study their habitat use. Turtles were on the rocky reef more frequently than the sandy bottoms ($\chi^2 = 29.90$, $p = 0.00$). The 95% fixed kernel density home range analysis revealed high-intensity use of the rocky reef, where hawksbills mainly dove in shallow waters (7.6 ± 3.3 m). Less than 5% of the 95% home range area overlapped with the Caletas–Arío National Wildlife Refuge. Hawksbills fed mainly on 2 invertebrate species regardless of season: a sponge (*Geodia* sp.) (mean volume = 67%) and a tunicate (*Rhopalaea birkelandi*) (mean volume = 51%). Surveys along the Nicoya Peninsula suggested that use of rocky reefs by juvenile hawksbill turtles was common. To protect juvenile hawksbills in the study area, the authors recommend that this site be granted official protection status as part of the Caletas–Arío National Wildlife Refuge. They also suggest studying other discrete rocky reefs along the Nicoya Peninsula to determine critical habitats for the hawksbill turtle to improve conservation and management policy.

EFFECTS OF MARKING BOREAL CHORUS FROGS

J. E. Swanson et al. [2013, Copeia 2013(4):670-675] note that toe clipping has historically been a standard marking method for wild amphibian populations, but more recent marking methods include visual implant elastomer and photo identification. Unfortunately, few studies have investigated the influence and effectiveness of marking methods for recently metamorphosed individuals and as a result little is known about this life-history phase for most amphibians. The authors explored survival probabilities, mark retention, and mark migration in postmetamorphic boreal chorus frogs (*Pseudacris maculata*) in a laboratory setting. One hundred forty-seven individuals were assigned randomly to two treatment groups or a control group. Frogs in the first treatment group were marked with visual implant elastomer, while frogs in the second treatment group were toe clipped. Growth and mortality were recorded for one year and resulting data were analyzed. Model selection results suggested that survival probabilities of frogs varied with time and showed some variation among marking treatments. It was found that frogs with multiple toes clipped on the same foot had lower survival probabilities than individuals in other treatments, but individuals can be marked by clipping a single toe on two different feet without any mark loss or negative survival effects. Individuals treated with visual implant elastomer had a mark migration rate of 4% and loss rate of 6%, and also showed very little negative survival impacts relative to control individuals.

Unofficial Minutes of the CHS Board Meeting, December 13, 2013

The meeting was called to order at 8:31 P.M. at the home of Andy and Linda Malawy. Board members Josh Baity, Stephanie Cappiello, and Cindy Steinle were absent.

Officers' Reports

Recording Secretary: The minutes of the November 15 board meeting were read, discussed and accepted.

Treasurer: The November treasurer's report was given, discussed and accepted.

Membership Secretary: Mike reported that there will be a net increase this month. The list of expiring memberships was read.

Sergeant-at-arms: October meeting attendance was 28.

Committee Reports

Shows:

- Notebaert Nature Museum, first full weekend of each month.
- Fishing, Travel and Outdoor Expos, Rosemont and Schaumburg, January 23–26.
- Great Lakes Pet Expo, Milwaukee, February 1.
- Boy Scout Dinner, Lagrange Park, February 19.
- Reptile Rampage, Lake Forest, March 9.
- Kids' Expo, Schaumburg, March 8–9.
- Chicagoland Family Pet Expo, Arlington Racetrack, March 14–16.

ReptileFest 2014: A planning meeting will be scheduled soon. Alan Resetar of the Field Museum has expressed an interest in exhibiting.

Old Business

Junior Herpers: Thirty-five people attended the December meeting.

New Business

Year-end donations: Jason proposed two organizations that he felt were worthy of help from the CHS. One was the Christmas CrocFest, which this year is benefiting conservation efforts for American crocodiles (*Crocodylus acutus*) in Jamaica. Mike Dloogatch moved to send them $1000, Jenny seconded, and after discussion the motion passed unanimously. The second was USARK, which is working to fight the addition of large constrictors to the injurious wildlife list of the Lacey Act. Jenny Vollman moved to donate $1000 to the defense fund, Mike Dloogatch seconded, and the motion passed unanimously.

Round Table

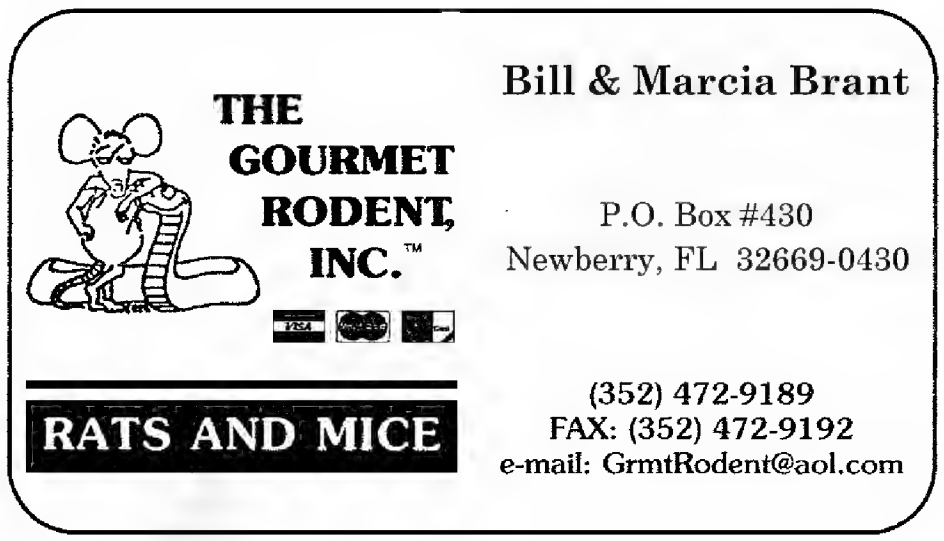
Barbara Nieri Hood made note of the fact that she and Jason have been together 5 years.

Dick Buchholz spent 3 weeks in Houston, and built an arbor for wisteria which attracted anoles.

Jason Hood informed the board that CHS member Mark Ericson is seriously ill.

The meeting was adjourned at 9:18 P.M.

Respectfully submitted by recording secretary Jenny Vollman



Advertisements

For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, PO Box 430, Newberry, FL 32669-0430, 352-472-9189, E-mail: GrmtRodent@aol.com.

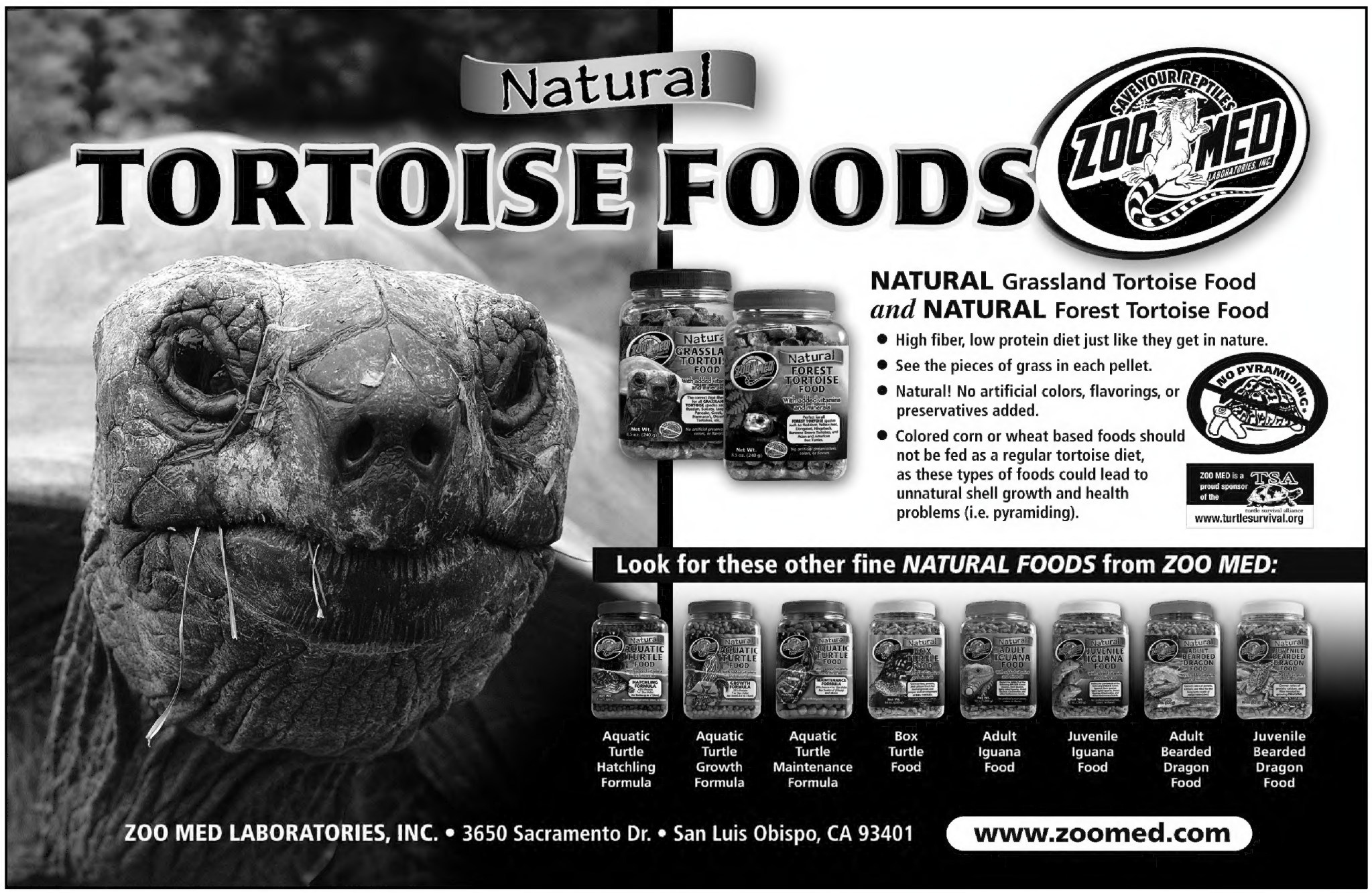
For sale: **highest quality frozen rodents**. I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm) , $25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), $27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm) , $30/100; Large fuzzy mice / hoppers (10 to 12 days old—8 to 10 gm), $35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

For sale: High quality, all locally captive-hatched tortoises, all bred and hatched here in the upper Midwest. Baby leopards, Sri Lankan stars, and pancakes usually available, and are all well-started and feeding great! Leopards are $125 ea., Sri Lankans (2012 hatched) $475 ea. And Pancakes are $195 ea. Leopards for out of state sale/shipping require a veterinary health certificate (inquire for cost). E-mail at KKranz1@wi.rr.com or call Jim or Kirsten at 262 654 6303.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site http://hiss-n-things.com and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Herpetological Researcher/Educator Internships! Research 4 Reptiles, LLC. is seeking two volunteer interns, ages 18 years and older, for the Summer 2014 season to assist in all aspects of herpetological research and educational classes. Our mission is to provide challenging, hands-on, field-based programs for participants ages 10 years and older to inspire enthusiasm for and understanding of native Illinois reptile and amphibian species. All educational programs are taught entirely outdoors at Midewin National Tallgrass Prairie in Wilmington, Illinois, and are limited to 8 participants. Internship details can be found on our website at: http://www.research4reptiles.biz. Email Holly Zak at research4reptiles@comcast.net or call 630-337-0757 for questions.

Line ads in this publication are run free for CHS members—$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.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Chicago Herpetological Society
Income Statement: January 1 – December 31, 2013

Income		Expense	
Adoptions	$ 440.00	Adoptions	$ 22.09
Grants	24.00	Grants	7,000.00
Membership dues	12,400.00	Bulletin printing / mailing	11,031.84
ReptileFest	54,887.10	ReptileFest	23,649.01
Other CHS shows	400.00	Other CHS shows	235.00
Merchandise sales	696.00	Cost of merchandise	0.00
Junior herpers	805.00	Junior herpers	1,056.03
Interest	26.21	Awards	61.64
Donations (unrestricted)	70.00	Library	45.00
Bulletin back issues	48.90	Rent (storage)	260.00
Bulletin ads	225.00	Bank / PayPal fees	137.06
Raffle	897.00	Donations (conservation)	6,000.00
Miscellaneous	45.00	Liability Insurance	3,311.00
		Equipment and supplies	2,164.69
		Licenses and Permits	76.00
		Postage	2,882.97
		Membership related	150.00
		Speaker reimbursement	2,216.23
		Telephone	149.14
		Miscellaneous	418.73
Total Income	$70,964.21	Total Expense	$60,866.43

Net Income $10,097.78

Chicago Herpetological Society
Balance Sheet: December 31, 2013

Assets	
Checking	$ 3,252.62
Money market	63,496.14
PayPal	1290.07
Postage on deposit	194.63
Total Assets	$68,233.46

Equity	
Restricted – Adoptions	$ 6,251.85
Restricted – Grants	2.00
Retained Earnings	51,881.83
Net Income	10,097.78
Total Equity	$68,233.46

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, January 29, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Dr. Joe Milanovich** will speak about "Amphibians and Global Change: What do we Stand to Lose?" In August 2013 Joe joined the faculty at Loyola University Chicago as an Assistant Professor in the Department of Biology. He teaches Ecology and his research examines the impact of global change on amphibians and the importance of herpetofauna to ecosystems.

The speaker for the February 26 meeting had not yet been confirmed when this issue went to press. Please watch the CHS website, www.chicagoherp.org, for details.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

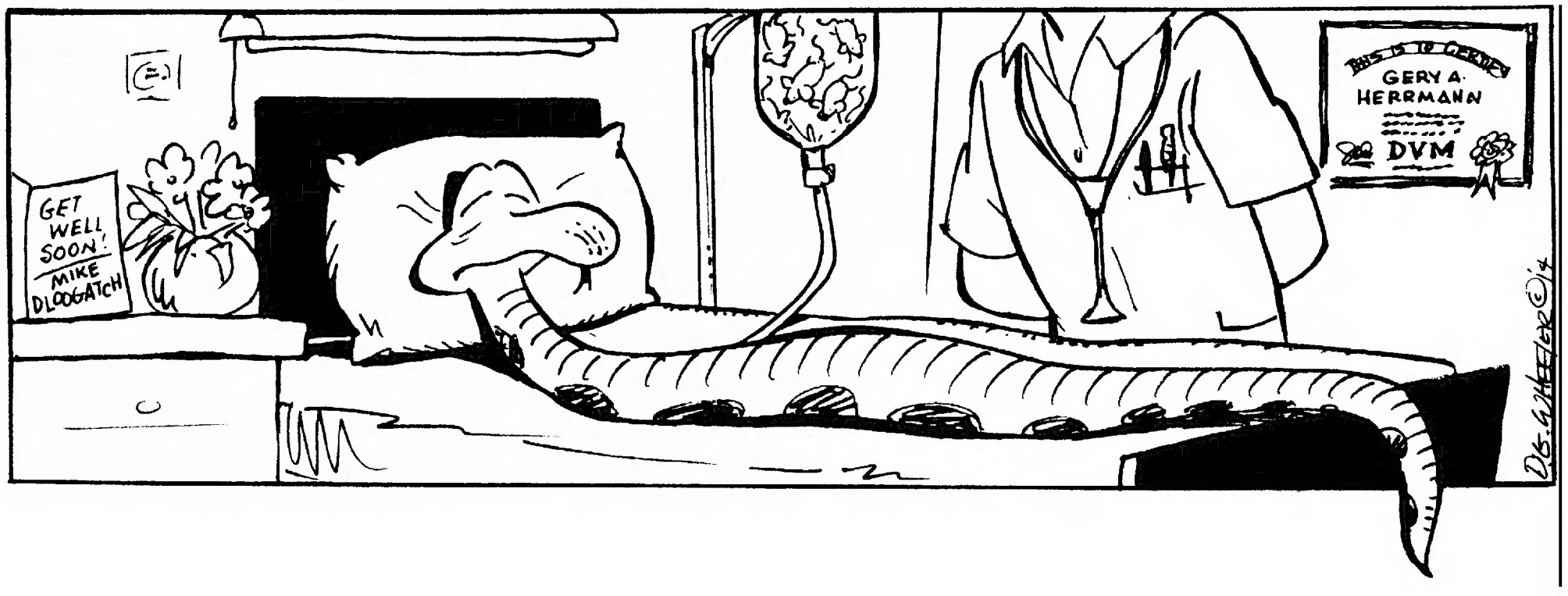
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., February 14, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg..

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

THE ADVENTURES OF SPOT



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